SPECIAL SPECIFICATION

SECTION 15060S

HANGERS AND SUPPORTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Supports, anchors and sleeves applicable to mechanical, plumbing, and fire protection systems**,** including:

1. Pipe, duct, and equipment hangers, supports, and associated anchors.
2. Equipment bases and supports.
3. Sleeves and seals.
4. Flashing and sealing equipment and pipe stacks.

1.02 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Provide hanger and support inserts and sleeves and coordinate placement into formwork.

1.03 RELATED SECTIONS

A. Section 13085S – Seismic Protection

B. Section 15083**S** – Pipe and Equipment Insulation.

C. Section 15250S – Pipe and Equipment Insulation for the MicroFab.

D. Section 15070S – Vibration Limits and Control.

E. Section 15090S – Polymer Process Piping Systems

1.04 REFERENCES

A. NFPA 13 - Standard for the Installation of Sprinkler Systems.

B. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems.

1. **Manufacturers Standardization Society MSS-SP-58, Pipe hangers and Supports – Material, Design and Manufacture.**

2. **Manufacturers Standardization Society MSS-SP-69, Pipe Hangers and Supports – Selection and application.**

3. **Manufacturers Standardization Society MSS-SP-89, Pipe Hangers and Supports – Fabrication and Installation Practices.**

4. **ASME B3.1 – Power Code.**

5. **ASME B3.1 – Process Piping Code.**

6. **PCI Design Handbook for Concrete Inserts Design.**

1.05 QUALITY ASSURANCE

A. Supports for Sprinkler Piping: NFPA 13.

B. Supports for Standpipes: NFPA 14.

C. Supports, Anchors, and Restraints:

1. **When supports and anchors, for equipment and supports for conduit, duct, and piping, are not shown on the Drawings, the Contractor shall be responsible for their design.**

2. **Connections to structural framing shall not introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.**

3. **Contractor engineered Support Systems shall be designed, detailed, and the submittals as required below shall bear the seal of a professional engineer registered in the state of New Mexico.**

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Pipe Hangers and Supports:

1. **Grinnell.**

2. **Pipe Shields**

3. **B Line.**

4. **Unistrut**

5. **Fronek Company**

6. **Piping Technology and Products**

7. **Bergen – Patterson**

B. Pipe Hanger Isolation Shields:

1. **Pipe Shields Incorporated.**

2. **Insul-Shield**

3. **Rilco**

4. **Bergen – Paterson**

C. Metal Framing Systems:

1. **Unistrut.**

2. **Superstrut.**

3. **Kin-Line.**

4. **Hilti**

5. **Power Strut**

D. Alignment Guides:

1. **Grinnel**

2. **Pipe Shields Inc.**

3. **Rilco**

4. **Bergen – Paterson**

2.02 GENERAL

A. All hangers, rods, clamps, protective shields, metal framing support components, and hanger accessories shall be electro-galvanized or cadmium plated unless primed and epoxy painted per painting specifications in Section 09900S – Equipment and Piping Painting, for clean and non-cleanroom applications. Supports with rust or corrosion shall be rejected and replaced by Contractor.

B. Provide oversized hangers for all insulated piping to accommodate insulation thickness specified in Specification Section 15250, Equipment and Piping Insulation.

C. The load limits for manufacturers hanger components shall not be exceeded.

D. Do not support piping with wire either temporarily or permanently.

E. Do not support piping over eight inches in diameter with slotted channels such as Unistrut P1000.

F. The maximum deflection of a channel member supporting at midpoint of span, shall not be greater than 1/8 inch.

PART 3 - PRODUCTS

3.01 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Provide malleable iron, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 to 4 Inches and Cold Pipe Sizes 6 Inches and Over: Carbon steel, adjustable, clevis.

C. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roll.

D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods; cast iron roll and stand for hot pipe sizes 6 inches and over.

E. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

F. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp; adjustable steel yoke and cast iron roll for hot pipe sizes 6 inches and over.

G. Vertical Support: Steel riser clamp.

H. Floor Support for Pipe Sizes to 4 Inches and All Cold Pipe Sizes: Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support.

I. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

J. Design hangers without disengagement of supported pipe.

K. Copper Pipe Support and Hangers: Carbon steel ring, adjustable, copper plated.

L. Shield for Insulated Piping 2 Inches and Smaller: 18 gage galvanized steel shield over insulation in 180-degree segments, minimum 12 inches long at pipe support.

M. Shield for Insulated Piping 2-1/2 Inch and Larger (Except Cold Water Piping): Use pipe covering protective saddles.

N. Shields for Insulated Cold Water Piping 2-1/2 Inch and Larger: Galvanized steel shields in 180-degree segments in accordance with following table:

Pipe	Metal Gage	Shield Length
2 1/2" to 5”	16	12”
6” to 12”	14	24”
Over 12”	12	24”

O. Shields for Vertical Copper Pipe Risers: Sheet lead.

3.02 HANGER RODS

A. Steel, threaded both ends, threaded one end or continuous threaded.

3.03 INSERTS

A. Provide malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

3.04 FLASHING

A. Metal Flashing: 26 gage galvanized steel.

B. Lead Flashing: 5 pounds per square foot sheet lead for waterproofing; 1 pound per square foot sheet lead for soundproofing.

C. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.

D. Caps: Steel, 22 gage minimum; use 16 gage at fire resistant elements.

3.05 EQUIPMENT BASES AND SUPPORTS

A. Provide concrete pads and equipment bases for all outdoor equipment on grade, floor mounted equipment in main central plant area, areas with floors below grade, penthouse equipment rooms, floor mounted air handling units and where shown on Drawings.

B. Provide prefabricated curbs for roof mounted equipment with the equipment.

3.06 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors: Form with 16 gage galvanized steel.

B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Above Grade: Form with 18 gage galvanized steel.

C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Provide prefabricated fire rated sleeves including seals, UL listed; or provide Schedule 40 galvanized steel, sized for minimum 1 inch space between sleeve and carrier pipe.

D. Sleeves for Pipes Through Floor Supporting Riser Piping: Standard weight galvanized steel pipe.

E. Sleeves for Pipes Through Roof: Standard weight galvanized steel pipe.

F. Sleeves for Round Ductwork: Form with galvanized steel.

G. Sleeves for Rectangular Ductwork: Form with galvanized steel or wood.

H. Provide fire-stop compound at all penetrations of floor slabs or firewalls such that fire rating integrity of barrier is not lessened.

I. Caulk: Caulk all sleeves water and airtight.

J. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping. Provide pipe sleeves one size larger than the pipe it serves, including insulation, except where "Link Seal" casing seals are used.

K. Sleeves Penetrating Walls Below Grade: Provide "Link-Seal" casing seal and sleeve as manufactured by Thunderline Corporation, Wayne, Michigan, for all pipes passing through walls below grade.

3.07 FINISHES

A. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

B. Provide corrosion resistant hangers and supports for all piping and ductwork in corrosive atmosphere.

3.08 ANCHOR BOLTS

A. Provide galvanized anchor bolts for all equipment placed on concrete pads or on concrete slabs of the size and number recommended by the manufacturer of the equipment.

PART 4 - EXECUTION

4.01 GENERAL

A. No attempt has been made to show all required pipe supports in all locations, either on the Drawings or in the details. The absence of pipe and duct supports and details on any Drawing shall not relieve the Contractor of the responsibility for furnishing and installing them as required.

B. Pipe support system components shall withstand piping dead loads, thermal loads, seismic, thrust, etc. The allowable load published by the component manufacturer shall not be exceeded.

C. All piping shall be supported in a manner which will prevent over stress on any valve, fitting, or piece of equipment. In addition, pipe supports shall be provided at changes in direction or elevation, adjacent to flexible couplings, and where otherwise shown. Pipe supports and hangers shall not be installed in equipment access areas, walkways or other access areas.

D. No copper pipe shall contact a pipe support or hanger of dissimilar metal. Hangers and supports for copper pipe shall be copper plated, plastic coated, or copper pipe shall be isolated with insulating neoprene strips or as approved.

E. No piping shall be supported from another pipe or any other equipment unless authorized by the SDR.

F. Oversized pipe hangers shall be used on all insulated piping to allow insulation to run continuous through the hanger or to allow clearance for pipe shields. Metallic pipes shall have no contact with hangers, clamps, brackets, or any other pipe support mechanism where sound and vibration control is required.

G. Piping hanger support rods shall attach to steel beams either utilizing center-loading I-beam clamp such as Grinnel Fig. 133, 134, 218, 228, or 292 or welded beam attachment with a swivel connection such as Grinnel Fig. 66 with Fig. 290 or 290L. Use of welded beam attachments without use of a swivel connection is prohibited for hot piping.

H. Install hangers without disengagement of supported pipe.

I. Radius, deburr, and prime saw – cut ends in accordance with Section 09920 Painting – Equipment and Piping. In areas where support members encroach into aisles, egress, etc., provide protection cap on ends.

J. Install and support nonmetallic piping and supported in a manner to prevent adverse affects to the system due to ambient changes which occur between installation and operation.

K. Install and support nonmetallic piping in outdoor conditions considering an exposure temperature range from minus 20 degrees F to 120 degrees F.

L. Install rods supporting hot piping or nonmetallic outdoor piping free to pivot at the connection to the upper steel or concrete attachment.

M. Do not allow direct contact of 16 inch and larger piping with the supporting steels such as channels, angle, or beams. Support all uninsulated piping 16 inches and larger utilizing protection saddles – Grinnell Figure 160; Pipe Guides – Grinnell Figure 255, 256, or Pipe Shields Inc Model 3000 through B3300 or B 7000 through B7300; Pipe Slids – Grinnell Figure 280, 435, 437, or Pipe Shields Inc. Model B1000 through B1300; or Pipe clamps – Grinnell Figure 216 or 260.

4.02 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as follows:

Pipe Size	Max. Hanger Spacing	Hanger Diameter
1/2" to 1-1/4"	6'-6"	3/8"
1-1/2" to 2"	10'-0"	3/8"
2-1/2" to 3"	10'-0"	1/2"
4" to 6"	10'-0"	**3/4**"
8" to 12"	14'-0"	7/8"
14" and Over	14'-0"	1"
PVC (All Sizes)	6'-0"	3/8"
C.I. Bell and Spigot (or No-Hub)	5'-0" and at Joints	

B. Where pipes run side by side, support on rod and angle iron or Unistrut trapeze hangers. Refer to Specification 15090S for polymer Process Piping Systems. Hanger spacing shall be as follows:

1. Horizontal:

Process Piping	**Maximum Spacing**
3/8" and smaller	**4'-0"**

½" through 1"	**7'-0"**
1-1/4" through 4"	**10"-0"**
5" through 8"	**16'-0"**
10" and larger	**20'-0"**

Copper Piping	**Maximum Spacing**
3/8" and smaller	**4'-0"**
1/2" through 3/4"	**6'-0"**
1" through 1-1/2"	**8'-0"**
2" and larger	**10'-0"**

C. Install hangers to provide minimum 1/2-inch space between finished covering and adjacent work.

D. Place a hanger within 12 inches of each horizontal elbow.

E. Use hangers with 1-1/2 inch minimum vertical adjustment.

F. Support horizontal cast iron pipe adjacent to each hub, with five feet maximum spacing between hangers.

G. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

H. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

I. Support riser piping independently of connected horizontal piping.

J. Provide corrosion resistant hangers by Corr-Tech for all piping hangers in corrosive areas. Provide hanger rods, bolts, nuts and all metal parts coated with the same material as hangers.

K. Do not hang from waffle slab in MicroFab. Use column to column steel instead. Construct rack supports and hangers in MicroFab subfab of B-Line, B-22A or similar channel, as shown on space management drawings and sections. Provide and install all fittings, braces, bolts and nuts to support utilities shown on plans and in sections. Connect channel to structural steel shown on SB100/858EF. Do not suspend from concrete waffle slab. Span between structural steel, and add intermediate channel to support utilities requiring minimum hanger spacing less than 8'-0" O.C. Submit detailed dimensioned rack show drawings for MicroFab subfab, identifying all components and anticipated loadings for review prior to any purchase or fabrication of rack components. Include seismic bracing and connection components for each and every type of utility supported by racks for review.

4.03 INSERTS

A. Provide inserts for placement in concrete formwork.

B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

D. Where concrete slabs form finished ceiling, provide inserts flush with slab surface.

E. Where inserts are omitted, drill through concrete slab from below and provide thru-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

4.04 FLASHING

A. Provide flexible flashing and metal **counter flashing** where sleeves, piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked 1 inch minimum into hub, 8 inches minimum clear on sides with 24-inch by 24-inch sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal **counter flash** and seal.

C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36-inch by 36-inch sheet size. Fasten flashing to drain clamp device.

D. Seal floor drains watertight to adjacent materials.

E. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms, installed in accordance with manufacturer's instructions for sound control.

F. Flexible sheet flash and **counter flash** all curbs for mechanical equipment on roof with sheet metal; seal watertight.

4.05 EQUIPMENT BASES AND SUPPORTS

A. Coordinate installation of equipment bases of concrete type specified under Division 3 for all outdoor equipment on grade and floor mounted equipment in main central plant area, areas with floors below grade, penthouse equipment rooms, floor mounted air handling units and where shown on Drawings.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct support of steel members. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

E. Provide base of a minimum height of 4 inches above finished grade and a width that projects a minimum of 3 inches beyond equipment on all sides. Bevel edges of base.

F. Prepare surface under bases by cleaning, clearing, chipping and roughing.

G. Provide curbs of 14 inches minimum height above roofing surface for installation of mechanical equipment on roof.

4.06 SLEEVES

A. Provide sleeves for all pipe penetrations through walls, roof or slab above grade.

B. Set sleeves in position in formwork. Provide reinforcing around sleeves.

C. Extend sleeves through floors 2 inches above finished floor level. Caulk sleeves full depth and provide floor plate.

D. Where piping or ductwork penetrates floor, ceiling or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and seal air tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration. When penetration is through a fire rated floor or wall, provide fire safing insulation so that the assembly when complete is UL listed and equals the fire rating of construction penetrated by the sleeve.

E. Install chrome plated steel escutcheons at finished surfaces.

F. Provide three 6 inch long reinforcing rods welded at 120-degree spacing to the sleeve on all sleeves supporting riser piping 4 inches and larger. Embed reinforcing rods in concrete or grout to existing concrete.

G. Install sleeve assembly for walls below grade with 1/4-inch thick plate located in the middle of the wall.

H. Neatly cut holes in existing walls, floors and roofs for placement of sleeves. Place sleeve and grout, and caulk annular space to provide finished appearance.

I. Install pipe in sleeve so that neither the pipe nor its insulation touches the sleeve at any point.

J. Seal space between pipe and sleeve watertight for all sleeves penetrating the roof.

4.07 ANCHOR BOLTS

A. Locate position of anchor bolts by means of suitable templates.

B. When equipment is placed on vibration isolators, secure equipment to the isolator and the isolator to the floor, pad or support as recommended by the vibration isolator manufacturer.

4.08 INSULATION SHIELDS

A. Provide insulation shields at every hanger support.

B. Provide shields of the proper length to distribute weight evenly and to prevent sagging or indentation of insulation at hanger.

C. Install shield so that hanger is placed at the center of the shield.

D. Attach shield to insulation with adhesive to prevent slippage or movement; refer to Section 15083.

4.09 PIPE CLAMPS

A. Use pipe clamps with vibration cushion B1999 B-Line or similar for process piping in MicroFab below 8".

B. Refer to specification 15090S for polymer process piping for special requirements.

END OF SECTION